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ONTARIO WATER
RESOURCES COMMISSION

ANNUAL REPORT 1965

WATERLOO

water pollution control plant

DIVISION OF PLANT OPERATIONS

Ontario Water Resources Commission

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ONTARIO WATER RESOURCES COMMISSION
OFFICE OF THE GENERAL MANAGER

Members of the Waterloo Local Advisory Committee,
City of Waterloo.

Gentlemen:

I am pleased to provide you with the 1965 Annual Report for the Waterloo Water Pollution Control Plant, OWRC Project No. 58-S-22.

We appreciate the co-operation you have extended to our Operations staff throughout the year, and trust that continuation of this close association will ensure even greater progress in the sphere of water pollution control.

Yours very truly,

D. S. Caverly,
General Manager.

ONTARIO WATER RESOURCES COMMISSION
801 BAY STREET
TORONTO 5

J. A. VANCE, LL.D.
CHAIRMAN

J. H. H. ROOT, M.P.P.
VICE-CHAIRMAN

D. S. CAVERLY
GENERAL MANAGER

W. S. MacDONNELL
COMMISSION SECRETARY

General Manager,
Ontario Water Resources Commission.

Dear Sir:

I am pleased to provide you with the 1965 Annual Report on the operation of the Waterloo Water Pollution Control Plant, OWRC Project No. 58-S-22.

The report presents design data, outlines operating problems encountered during the year and summarizes in graphs, charts and tables all significant flow and cost data.

Yours very truly,

B C Palmer

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

This report provides useful information on the operating efficiency of this project during 1965. It is intended to act as a guide in gauging plant performance. To implement that aim, it includes detailed statistical and cost data, a description of the project and a summary of its operation during the year.

Of particular interest will be the cost data, which show the total cost to the municipality and the areas of major expenditure.

The Regional Operations Engineer is primarily responsible for the preparation of the report, and has compiled and arranged the material. He will be pleased to answer any questions regarding it. Other groups, however, were involved in the production, and these include the statistics section, the Drafting Section of the Division of Sanitary Engineering and the Division of Finance.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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WATERLOO

water pollution control plant

operated for

THE CITY OF WATERLOO

by the

ONTARIO WATER RESOURCES COMMISSION

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VICE-CHAIRMAN: **J. H. H. Root, M.P.P.**

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W. S. MacDonnell

DIVISION OF PLANT OPERATIONS

DIRECTOR: **B. C. Palmer**

Assistant Director:	**C. W. Perry**
Regional Supervisor:	**D. A. McTavish**
Operations Engineer:	**B. W. Hansler**

801 Bay Street Toronto 5

'65 REVIEW

The operating costs for Waterloo WPCP continued to increase in 1965 due to the increased cost of labour, supplies and maintenance. The trend to increased maintenance costs continued during the year due to the fact that the equipment was operated continually to cope with the plant overloading.

A total of 924.094 million gallons of sewage were treated during the year at a total cost of $140,427.32. The operating cost per million gallons and the cost per pound of BOD removed were $151.96 and $0.04 respectively.

The average daily flow during 1965 was 2.53 million gallons per day which represents an 8.3% increase over the average daily flow of 2.34 million gallons per day for 1964. The average daily flow of 2.53 million gallons is consistent with the trend to increased flows at the plant.

Although there was a decrease in organic loadings in 1965, the BOD and suspended solids concentrations were still considerably above the design values.

The average BOD and suspended solids removals of 92.5% and 89.0% respectively are considered good for the type of treatment at the project. However, because of the high organic loads received, the BOD and suspended solids concentrations of the final effluent were higher than the Commission objective much of the time.

The plant staff under the supervision of head office engineers, constantly attempted to obtain the most efficient treatment possible.

GLOSSARY

BOD	biochemical oxygen demand (a measure of organic content)
cfm	cubic feet per minute
comminution	shredding of solids into small fragments
DWF	dry weather flow
effluent	outflow
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
grit	sand, dust, stones, cinders and other heavy inorganic material
influent	inflow
lin. ft.	lineal feet
mgd	million gallons per day
mlss	mixed liquor suspended solids
ppm	parts per million
ss	suspended solids
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)

HISTORY

1956 - 1964

INCEPTION

In 1956, the City of Waterloo and the Ontario Water Resources Commission initiated plans to provide secondary treatment additions to the Waterloo Water Pollution Control Plant.

The firm of Proctor and Redfern, Toronto, Ontario, Consulting Engineers, was engaged to prepare plans and specifications for the project.

APPROVAL

On January 24, 1958, the Ontario Municipal Board granted approval for the plant extensions and the city signed an agreement with the Ontario Water Resources Commission to finance, construct and operate the plant.

CONSTRUCTION

Ball Brothers Construction Company, Kitchener, Ontario, began construction in 1959 and by April of 1960, the Division of Plant Operations assumed the responsibility of operating the new plant.

TOTAL COST (Final)

STAGE I:	$728,675.93
STAGE II:	$ 13,226.41

E. H. HAY
CHIEF OPERATOR

Project Staff

Maintenance Technician - R. Sellence

Operators

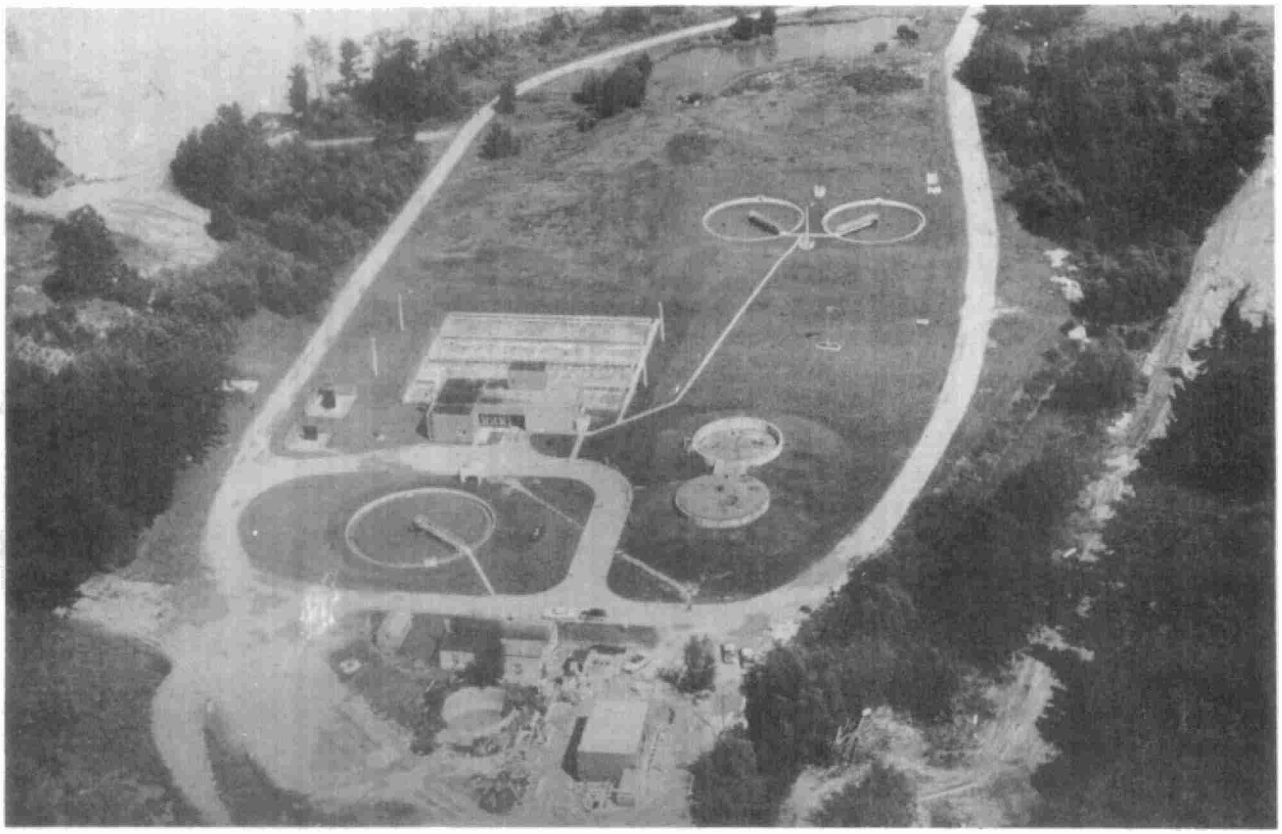
A. Franz	R. D. Matthews
F. Hamer	D. M. Coates
R. R. Gellatly	D. J. Ellis

COMMENTS

The plant is staffed 16 hours per day, 7 days per week between the hours of 7 a.m. and 11 p.m. The total staff complement is eight men.

In June, Mr. D. J. Ellis replaced Mr. B. E. Snider on the operational staff.

Mr. F. Hamer completed the basic and intermediate sewage operators' course sponsored by the OWRC. The senior operators' course will be conducted early in 1966.



Description of Project

INFLUENT WORKS

Flow enters the plant from a new pumping station located at the plant site. This station receives sewage via two trunk sewers and provides comminution. Flow enters the detritor room through a mechanically cleaned bar screen and is directed to an 18" Parshall flume where the flow quantity is measured and recorded. A twelve foot square detritor provides 30 seconds retention at design flow to remove non-organic solids. The sand and grit settled out is removed by a mechanical raking mechanism to a wheelbarrow and is buried on the plant grounds.

PRIMARY SEDIMENTATION

A 75 foot diameter concrete clarifier receives sewage from the grit removal unit. The clarifier has a 9 foot side wall depth with a 12 foot depth at the centre. A retention period of 1.66 hours at design flow allows settleable solids in the incoming sewage to settle to the bottom of the tank. A circular scraper mechanism removes the settled sludge to a central hopper from where it is pumped to vacuum filtration facilities.

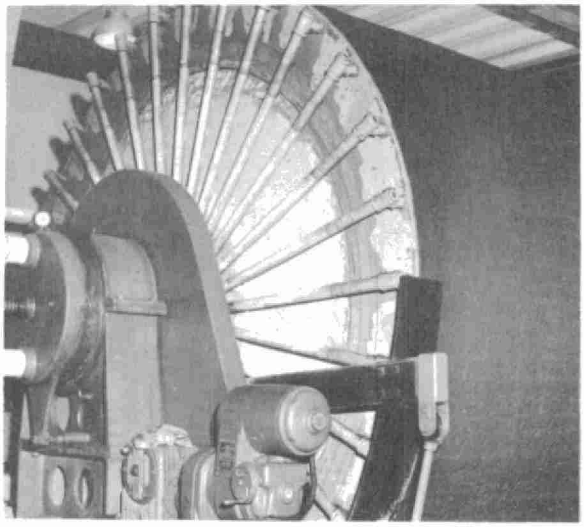
AERATION

Four single pass aeration tanks with a total volume of 1.5 million gallons provides 7.2 hours retention at design flow and 25% return sludge. Each tank is 136 ft. x 30 ft. with a 15 ft. side wall depth. Air is supplied by two air compressors each rated at 3,750 cubic feet of air per minute.

Aerobic digestion of suspended and dissolved solids results from the action of the activated sludge in the presence of oxygen.

FINAL SEDIMENTATION

Two 65 foot diameter circular concrete final clarifiers with a 10 foot side wall depth receive the mixed liquor from the aeration section. Each tank has a volume of 230,000 Imperial gallons and together they provide 2.75 hours retention at design flow. The flocculant activated sludge settles out in these clarifiers leaving a clear effluent which overflows a peripheral weir, is chlorinated and is directed to the Grand River.


VACUUM FILTER

FINAL CLARIFIER; CHLORINE CHAMBER AT LEFT

The activated sludge is collected by circular mechanisms and a portion of it is returned to feed the aeration process.

Excess activated sludge is wasted to the primary clarifier and is filtered with the raw sludge.

VACUUM FILTER

Waste activated and raw sludge are stored in the primary clarifier and pumped to the vacuum filtering unit. This unit is a 300 square foot Komline-Sanderson stainless steel coil spring vacuum filter. The filter drum is placed under a vacuum and moisture is drawn from the sludge. Lime and ferric chloride solutions are used to coagulate the sludge solids prior to filtration. The concentrated sludge is hauled to farmland and sanitary landfill areas by truck. The moisture removed is returned to the aeration section to be treated biologically.

CHLORINE CONTACT CHAMBER

Chlorination is practiced to disinfect harmful bacteria in the effluent. A chlorine residual of 0.5 PPM after 15 minutes of contact time is maintained.

PROJECT COSTS

STAGE I

NET CAPITAL COST (Final) Long Term Debt to OWRC	$728,675.93
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1965	$148,330.89

Net Operating	$140,427.32
Debt Retirement	26,436.00
Reserve	5,197.62
Interest Charged	40,883.87
TOTAL	$212,944.81

RESERVE ACCOUNT

Balance at January 1, 1965	$ 17,716.70
Deposited by Municipality	5,197.62
Interest Earned	1,090.23
	$ 24,004.55
Less Expenditures	-
Balance at December 31, 1965	$ 24,004.55

STAGE II

NET CAPITAL COST (Final) Long Term Debt to OWRC	$13,226.41
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1965	$ 1,770.13
Net Operating	$ NIL
Debt Retirement	552.00
Reserve	159.16
Interest Charged	742.09
TOTAL	$ 1,453.25

RESERVE ACCOUNT

Balance at January 1, 1965	358.86
Deposited by Municipality	159.16
Interest Earned	22.87
	$ 540.89
Less Expenditures	-
Balance at December 31, 1965	$ 540.89

MONTHLY OPERATING COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	* SUNDRY
JAN	4903.93	2988.26				139.28	131.30	29.46	148.46	1467.17
FEB	7796.83	2969.80		354.76	1778.41	1912.04	88.37	7.44	74.31	611.70
MARCH	9224.25	3333.62		393.53	1599.91	482.18	347.17		467.74	2600.10
APRIL	9555.99	3535.67		541.55	1532.12	2711.45	143.16	205.41	49.17	837.46
MAY	15851.37	4671.81	226.82	197.40	1614.34	1816.41	440.35	791.56	830.43	5262.25
JUNE	12307.28	3183.50	495.64	128.64	1658.19	730.74	204.35	865.32	1940.13	3101.10
JULY	12641.31	3447.24	456.97		1592.78	3047.37	299.90	58.83	811.39	2926.83
AUG	13582.14	3040.63	527.06		1583.24	709.45	224.20	254.69	1912.45	5330.42
SEPT	9104.22	3150.58	203.51		1671.91	487.16	132.91	182.34	447.27	2828.54
OCT	14549.87	4643.31			1853.33	2427.99	114.71	10.41	3119.84	2380.28
NOV	5283.72	3281.56			1613.77		195.19	3.56	98.05	91.59
DEC	25626.41	3445.90		525.05	3488.72	1252.98	361.73	49.08	10862.60	5640.35
TOTAL	140427.32	41691.88	1910.00	2140.60	19986.72	15717.05	2683.34	2458.10	20761.84	33077.79

* SUNDRY INCLUDES SLUDGE HAULING COSTS WHICH WERE $25,565.88

BRACKETS INDICATE CREDIT

YEARLY OPERATING COSTS

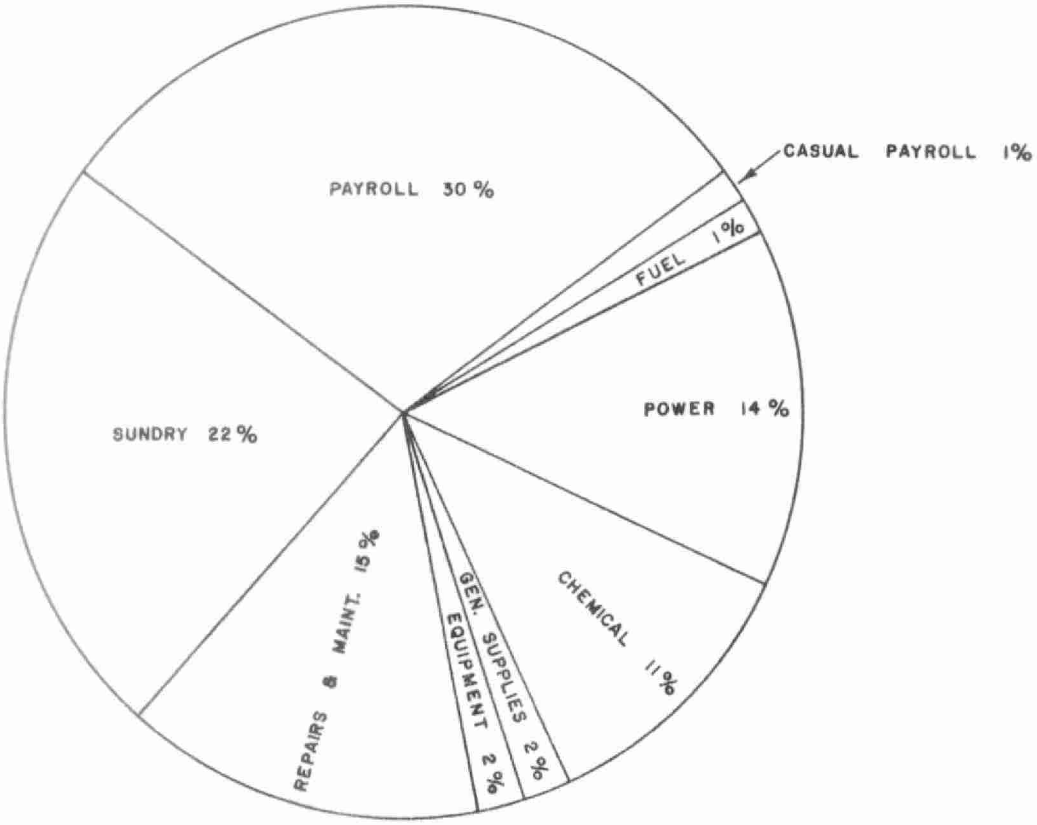
YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER L.B. OF BOD REMOVED
1961	599.373	$ 80710	* $ 14.20	$ 134.25	-
1962	736.953	86442	15.17	117.30	2 CENTS
1963	762.446	96410	15.87	126.45	2 CENTS
1964	852.937	112363	18.72	131.74	2 CENTS
1965	924.094	140427.32	21.49	151.96	4 CENTS

* BASED ON ESTIMATED ANNUAL POPULATION AND 3.9 PERSONS PER FAMILY

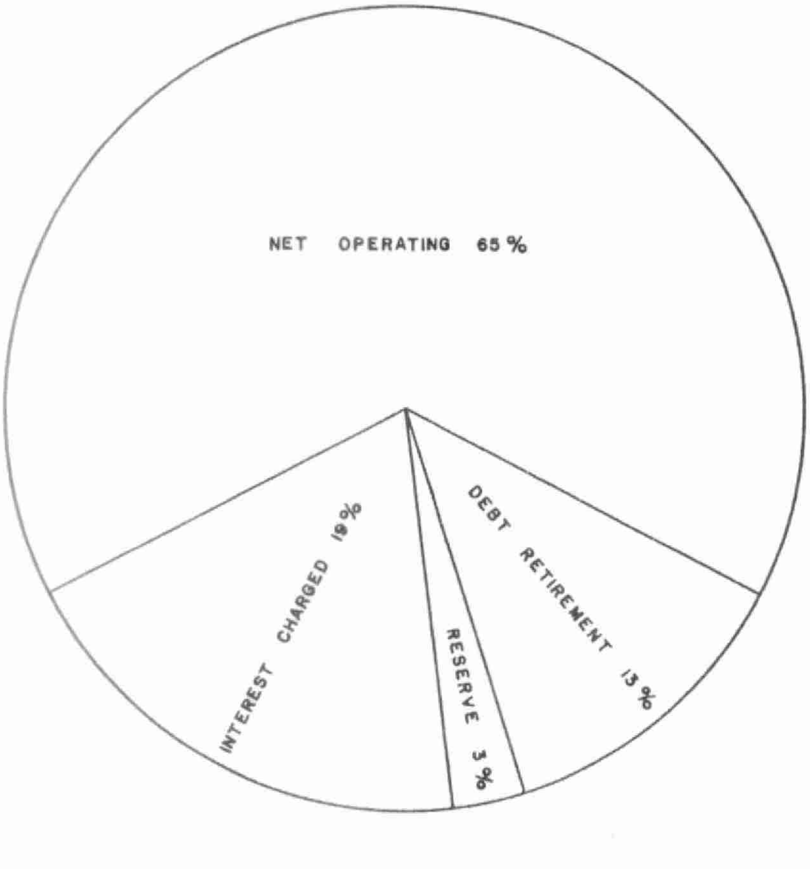
VACUUM FILTER COSTS (MONTHLY)

MONTH	COST PER MONTH					TOTAL	COST PER TON DRY WEIGHT					TOTAL
	$FeCl_3$	LIME	LABOUR	ELEC	MAINT		$FeCl_3$	LIME	LABOUR	ELEC	MAINT	
JANUARY	852.58	505.47	552.50	161.08	127.50	2199.13	5.29	3.14	3.43	1.00	0.79	13.65
FEBRUARY	391.82	388.54	459.24	133.89	127.50	1500.99	2.93	2.90	3.43	1.00	0.95	11.21
MARCH	931.98	595.36	645.11	188.08	127.50	2488.03	4.96	3.17	3.43	1.00	0.68	13.24
APRIL	963.53	508.64	627.11	182.83	127.50	2409.61	5.27	2.78	3.43	1.00	0.70	13.18
MAY	548.09	440.43	498.76	145.41	127.50	1760.19	3.77	3.03	3.43	1.00	0.88	12.11
JUNE	809.29	491.58	694.40	202.45	127.50	2325.22	4.00	2.43	3.43	1.00	0.63	11.49
JULY	619.80	484.28	488.98	142.56	127.50	1863.12	4.35	2.98	3.43	1.00	0.89	12.65
AUGUST	532.61	328.37	319.88	93.26	127.50	1401.62	5.71	3.52	3.43	1.00	1.37	15.03
SEPTEMBER	180.62	115.71	126.50	36.88	127.50	587.21	4.90	3.14	3.43	1.00	3.46	15.93
OCTOBER	29.84	19.49	35.33	10.30	127.50	222.46	2.90	1.89	3.43	1.00	12.38	21.60
NOVEMBER	166.09	93.06	120.15	35.03	127.50	541.83	4.74	2.66	3.43	1.00	3.64	15.47
DECEMBER	391.08	267.96	265.96	77.54	127.50	1130.04	5.04	3.46	3.43	1.00	1.64	14.57
TOTAL	6417.33	4238.89	4833.92	1409.31	1530.00	18429.45	53.86	35.10	41.16	12.00	28.01	170.13
AVERAGE PER MONTH	534.78	353.24	402.83	117.44	127.50	1535.79	4.49	2.92	3.43	1.00	2.33	14.18

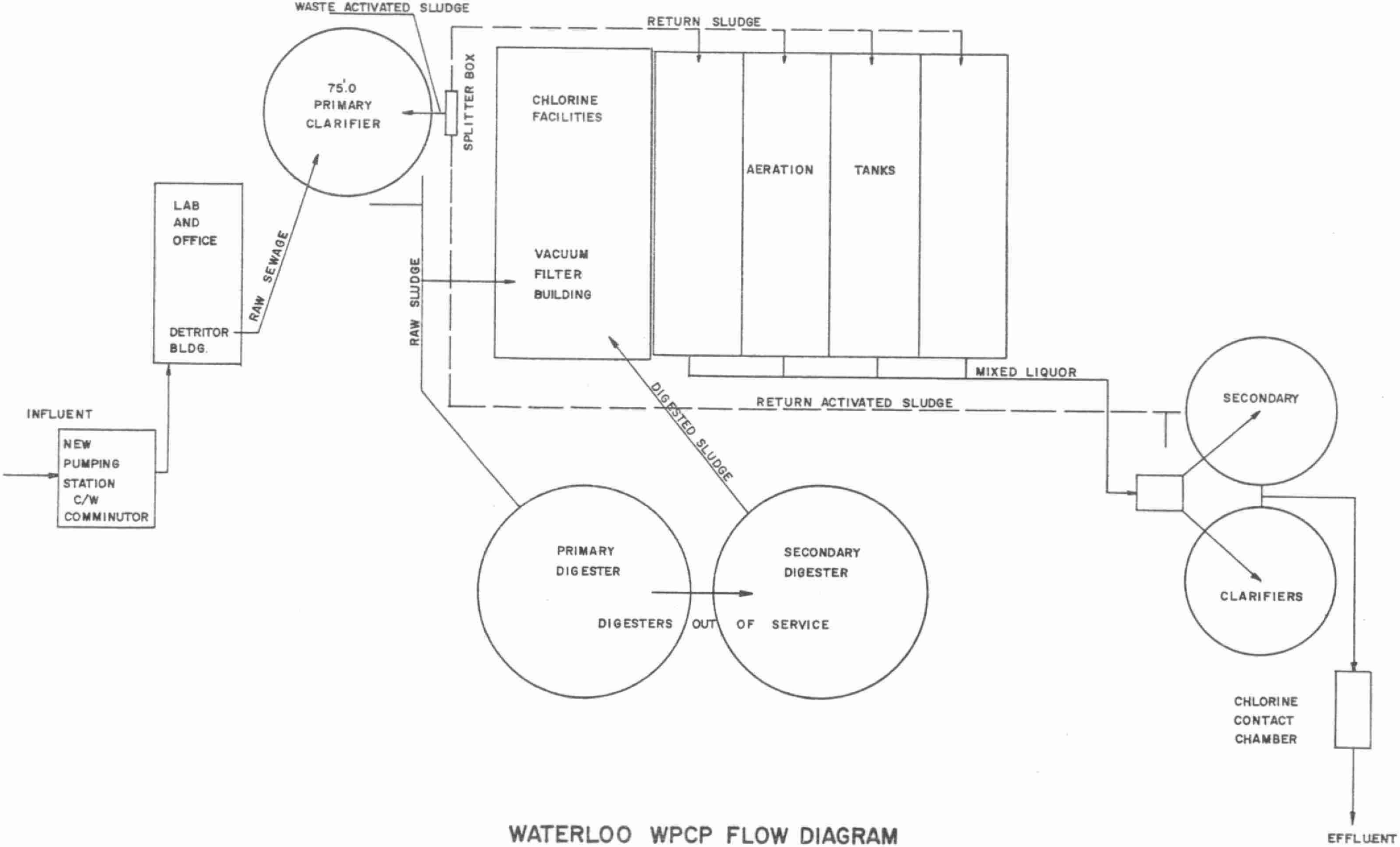
1965 OPERATING COSTS



TOTAL ANNUAL COST



Technical Section



WATERLOO WPCP FLOW DIAGRAM

Design-Data

GENERAL

Type of Plant - Activated sludge.

Design Population - 20,000.

Design Plant Flow - 4.0 MGD.

Per Capita Flow - 200 GPCD

Five Day BOD -

Raw Sewage	-	300 PPM
Removal	-	90%

Suspended Solids -

Raw Sewage	-	270 PPM
Removal	-	90%

PRIMARY TREATMENT

Screening

Dorr-Oliver mechanically cleaned bar screen.

Grit Removal

12 ft. square concrete grit chamber with Dorr-Oliver mechanical raking mechanism.

PRIMARY CLARIFICATION

One 75 ft. diameter concrete clarifier with Link Belt scraping and skimming mechanism.

Detention time - 1.66 hours @ 4.0 MGD.

SECONDARY TREATMENT

Aeration Section

Four concrete tanks 136 ft. x 30 ft. with a 15 ft. side wall depth. Air supplied from two Sutorbilt rotary compressors each rated at 3,750 cubic ft. per minute. Air supplied through 264 Walker spargers in the aeration tanks on 2 ft. c/c spacings.

Final Settling Tanks

Two 65 ft. diameter concrete tanks with 10 ft. side wall depth equipped with Dorr-Oliver scraping mechanism.

Detention time - 2.75 hours @ 4.0 MGD.

Vacuum Filtration

One 300 square ft. Komline-Sanderson stainless steel coil spring filter, together with a 13" HG vacuum pump and associated chemical storage and mixing facilities.

Chlorination

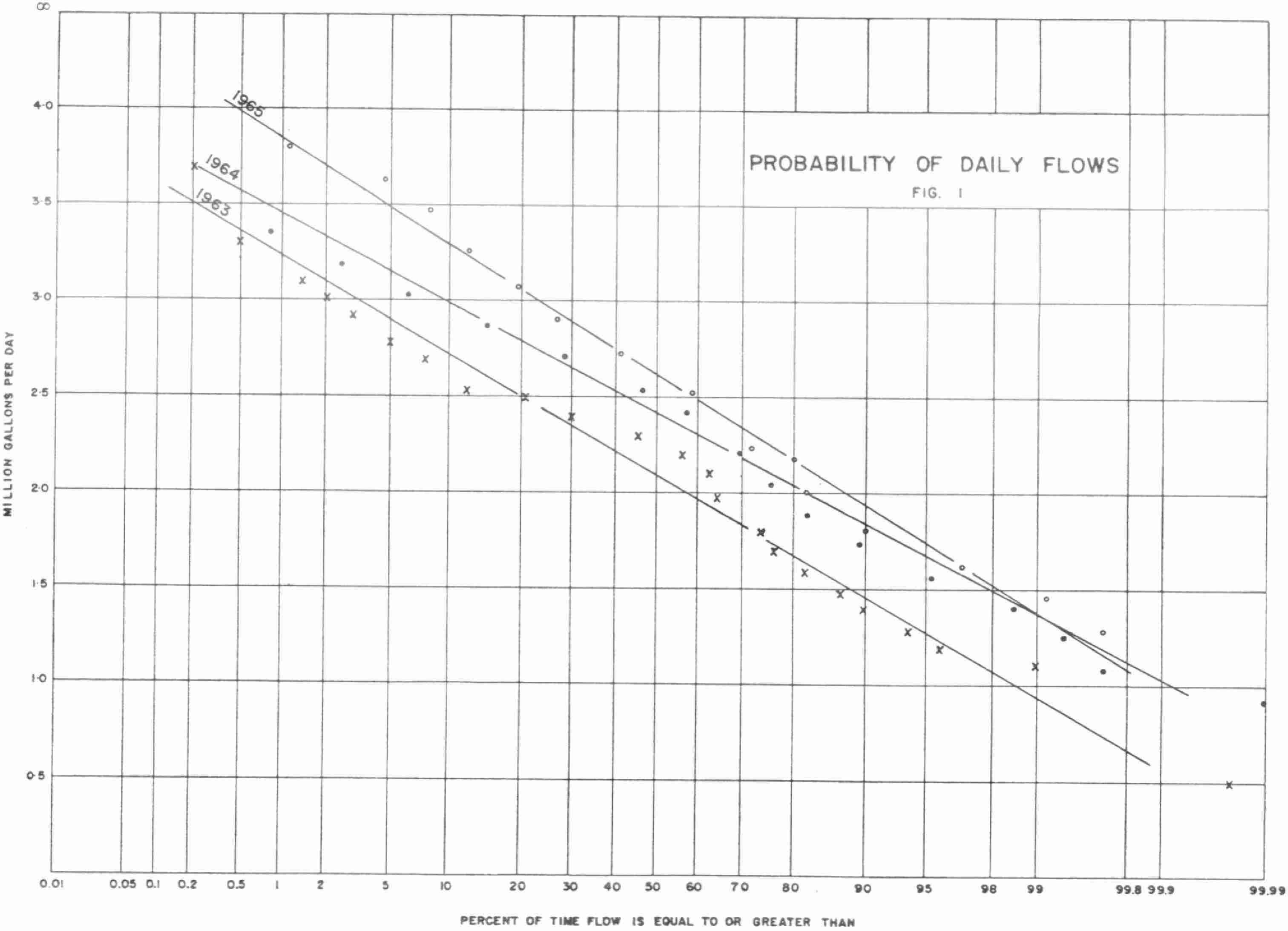
One B. I. F. 400 pounds per day chlorinizer.

Process Data

The monthly average total daily flows for January 1960 to December 1965 are shown in Figure No. 2. The average daily flow of 2.53 million gallons per day for 1965 represents an 8.3% increase over the average of 2.34 million gallons per day for 1964. During 1965, 924.09 million gallons of raw sewage composed of domestic and industrial wastes received treatment.

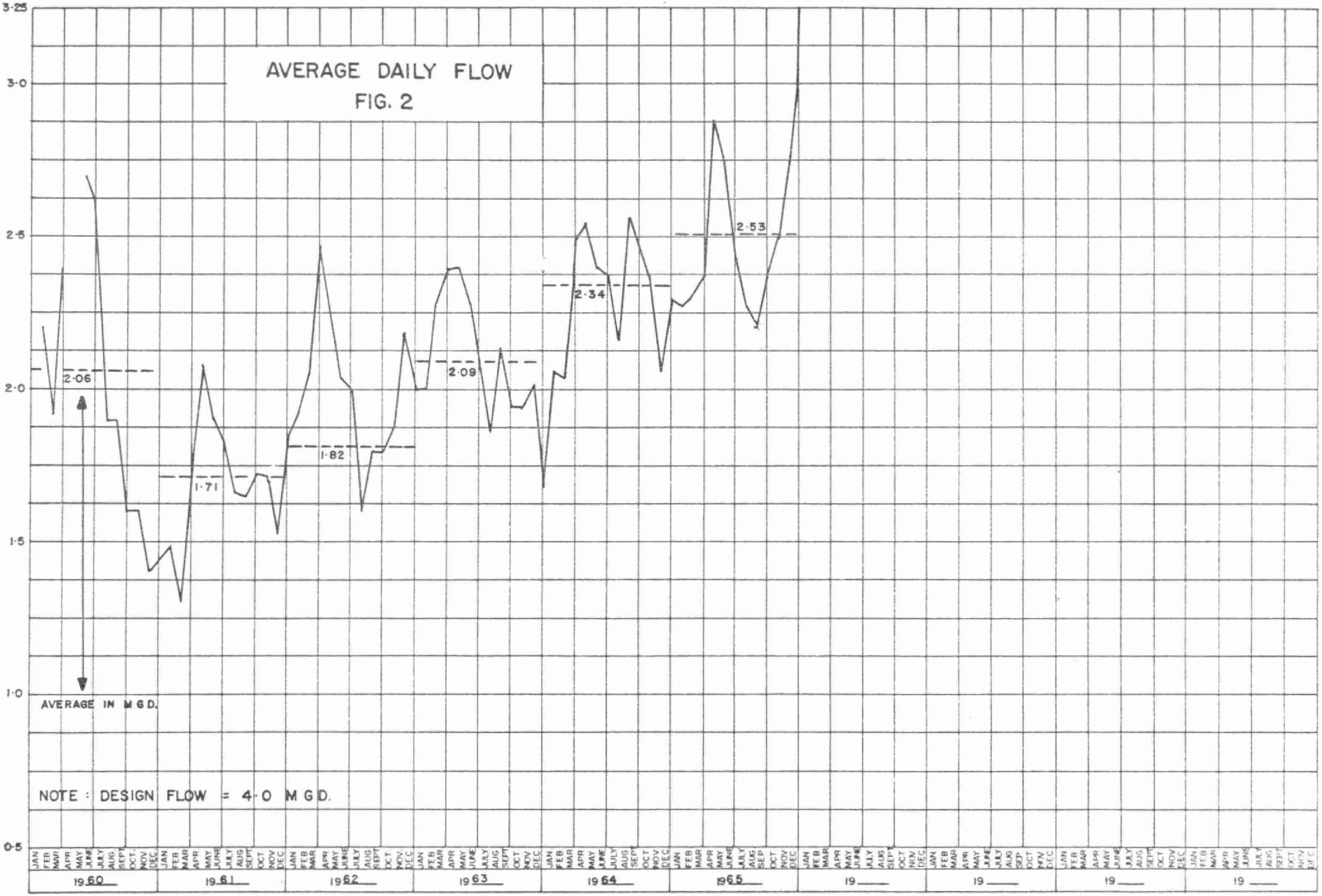
The maximum average daily flow for the month of 3.18 million gallons was received in December. A peak average daily flow for the month of 2.90 million gallons also was received in April during the spring run-off period. These peak flows are exemplified on Figure No. 2.

From Figure No. 1, it can be seen that the plant design flow of 4.0 million gallons per day was exceeded less than 1% of the time during 1965 and one-half the design flow was exceeded 88% of the time.



PROBABILITY OF DAILY FLOWS

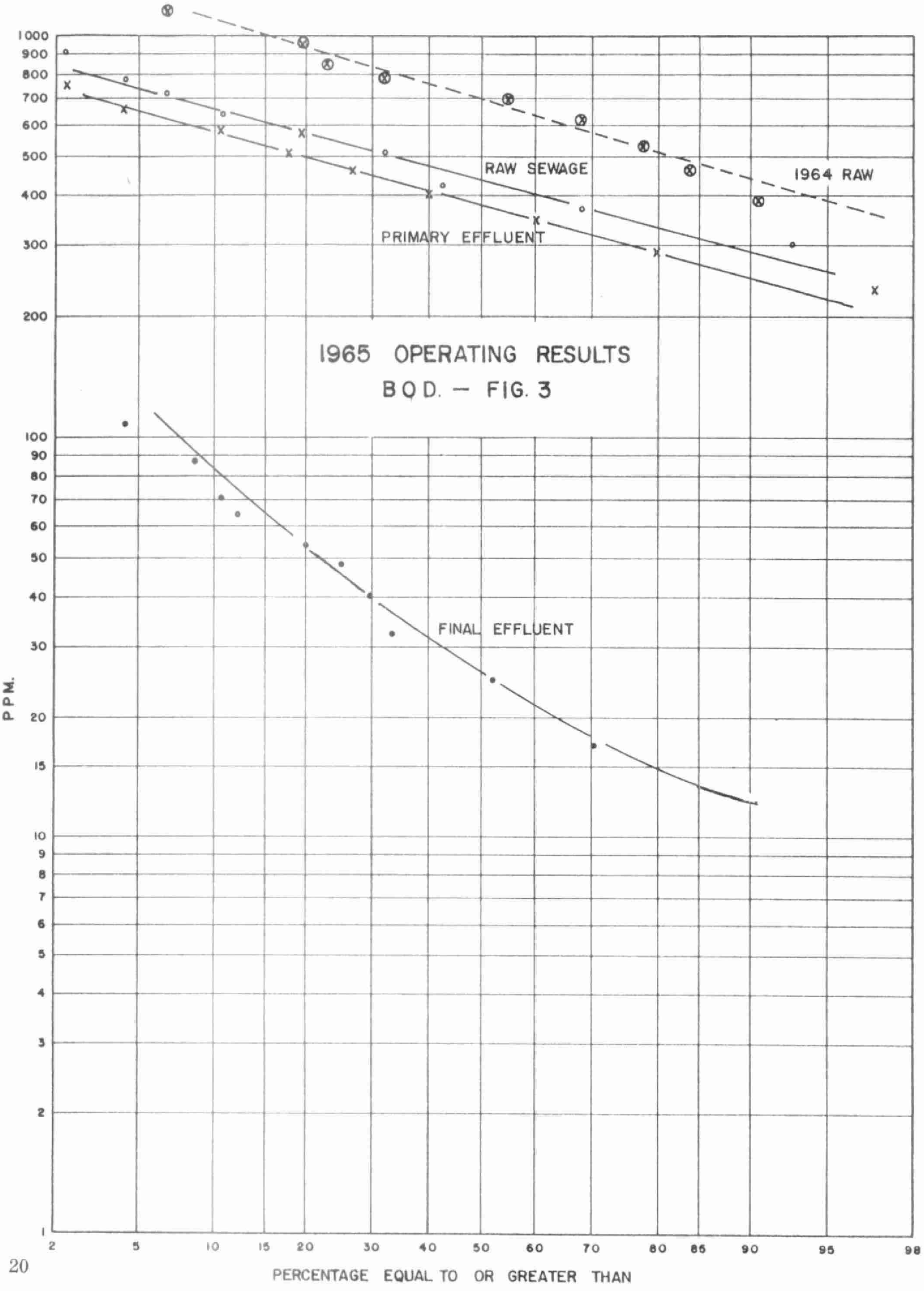
FIG. 1



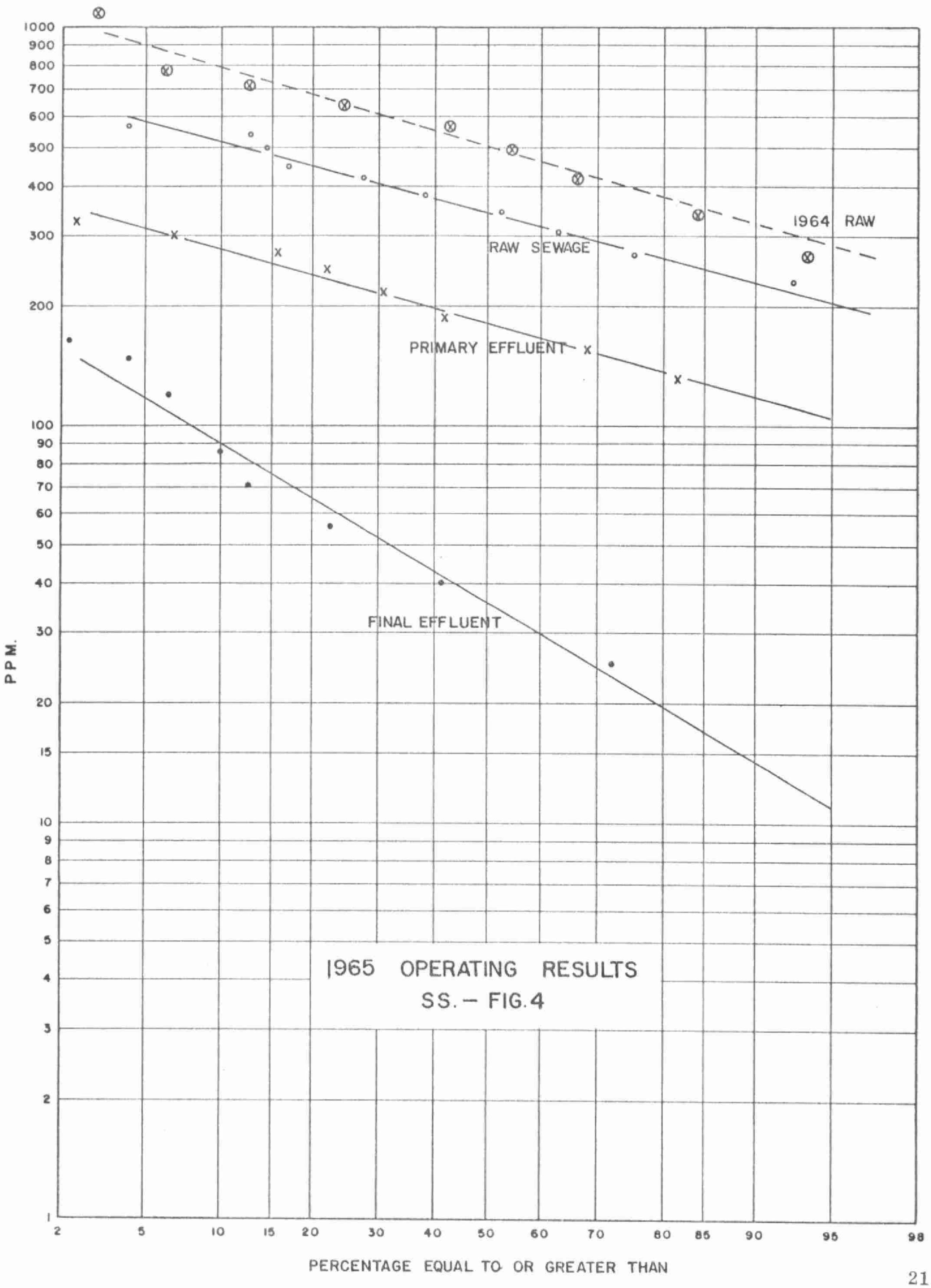
AVERAGE DAILY FLOW

FIG. 2

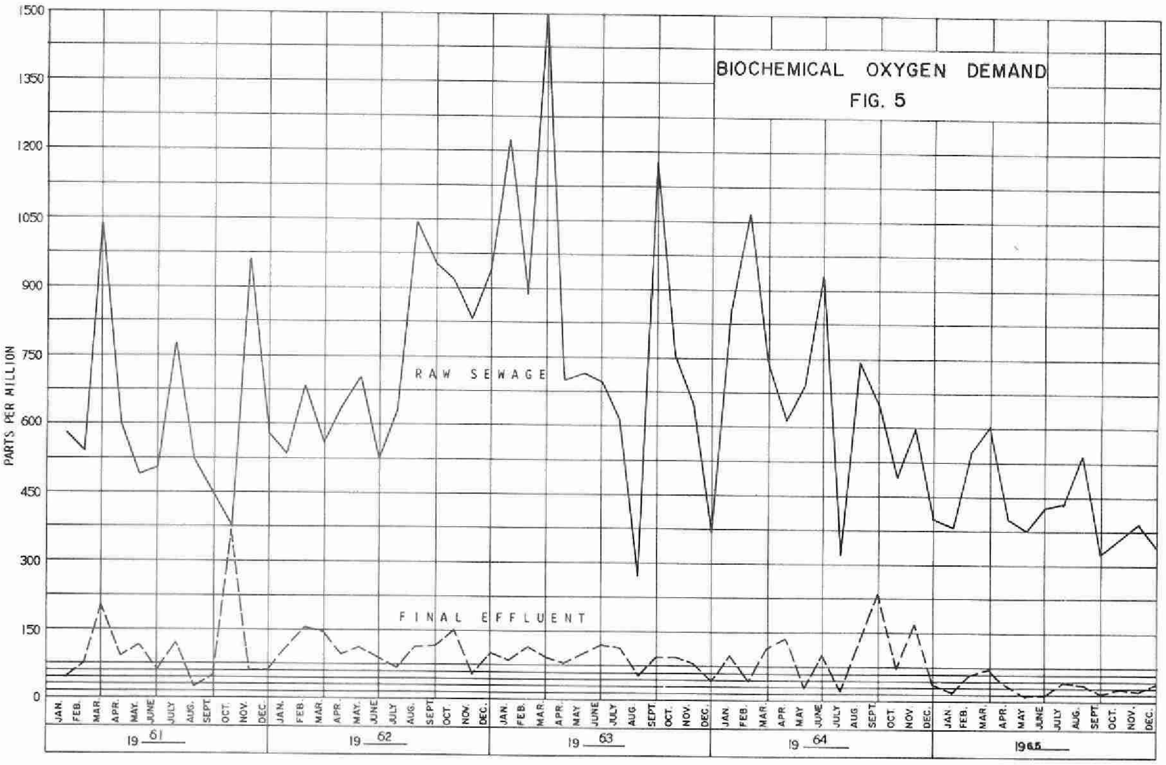
NOTE : DESIGN FLOW = 4·0 M G D.



1965 OPERATING RESULTS
BOD. — FIG. 3

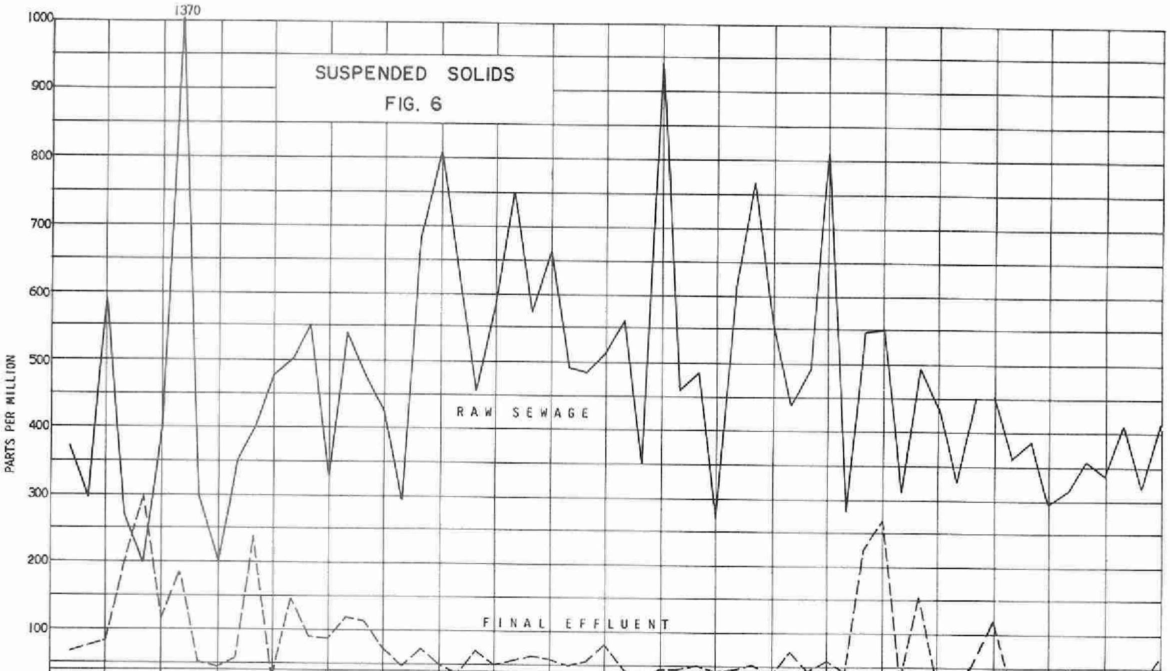


1965 OPERATING RESULTS
SS. – FIG. 4



BIOCHEMICAL OXYGEN DEMAND
FIG. 5

MONTHLY VARIATIONS



SUSPENDED SOLIDS
FIG. 6

GRIT, B.O.D AND S.S. REMOVAL

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	380	20	94.5	127.3	324	19	94.0	107.8	53
FEB.	542	59	89.0	156.0	450	52	88.5	123.1	104
MAR.	600	69	88.5	251.0	456	118	74.0	124.4	89
APR.	402	32	92.0	160.6	361	24	93.5	146.3	59
MAY	376	12	97.0	154.6	386	12	97.0	158.9	55.5
JUNE	424	13	97.0	151.2	295	21	93.0	100.8	31.5
JULY	435	37	91.5	140.6	313	47	85.0	93.9	59.5
AUG.	538	36	93.5	172.3	358	42	88.0	108.4	127
SEPT.	322	18	94.5	108.6	332	28	91.5	108.6	85.5
OCT.	356	24	93.0	128.6	408	34	91.5	144.9	83
NOV.	394	23	94.0	154.3	318	26	92.0	121.5	77.5
DEC.	330	36	89.0	144.6	358	58	84.0	147.6	115
TOTAL	–	–	–	1815.8	–	–	–	1492.4	940
AVG.	425	32	92.5	151.3	363	40	89.0	124.4	78

The BOD and suspended solids concentrations are based on the laboratory analysis of 8 hour composite samples collected at weekly intervals. Figures 3 and 4 present a probability plot of the BOD and suspended solids concentrations of the raw sewage, primary effluent and final effluent for the year. The average monthly BOD and suspended solids concentrations are presented on figures 5 and 6.

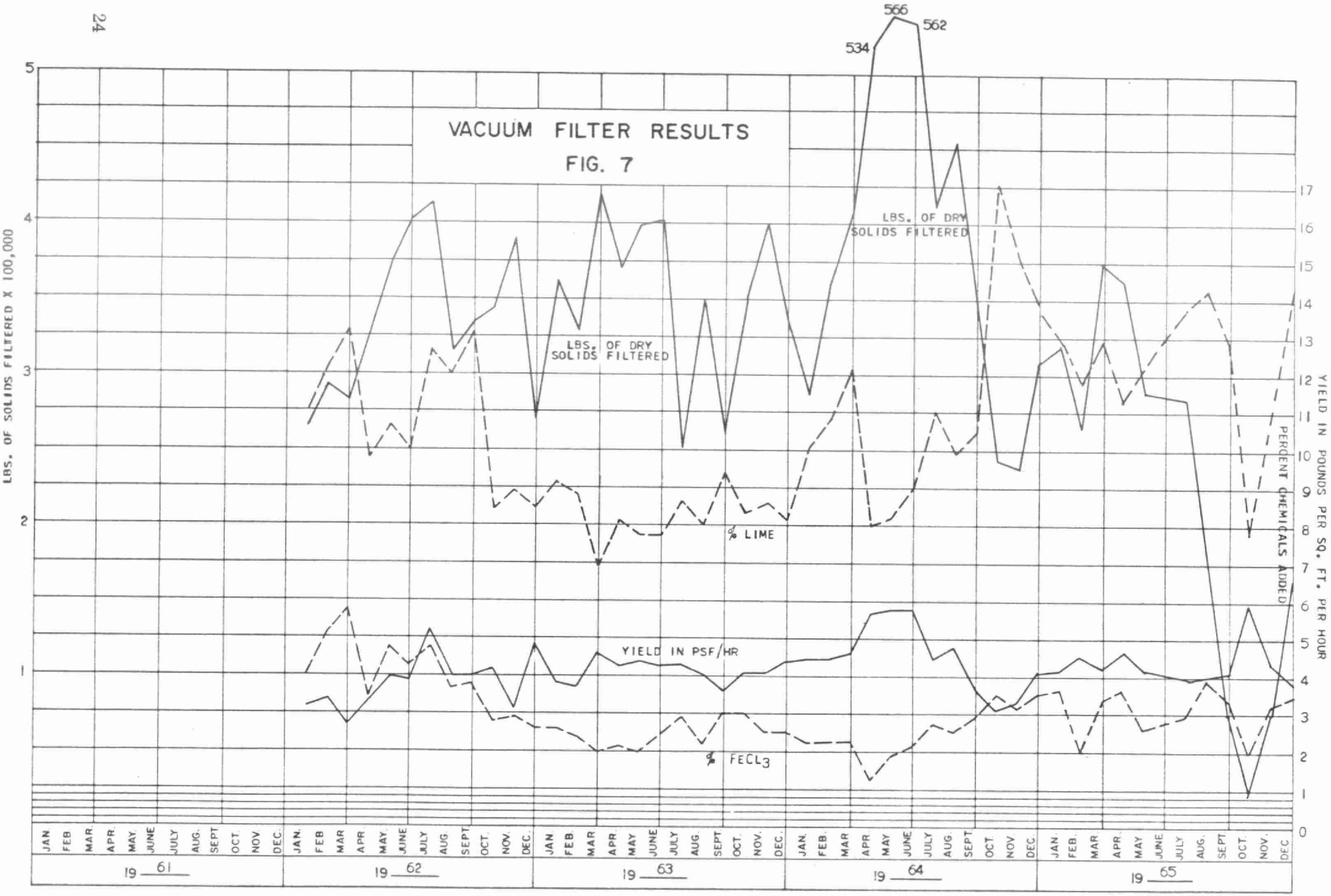
The average BOD loading of 425 ppm was 1.42 times the design loading of 300 ppm. It can be seen from figure 3 that the raw sewage BOD concentration exceeded the design value 89% of the time.

The average final effluent BOD concentration of 32 ppm was greater than the OWRC objective of 15 ppm. The final effluent BOD exceeded this objective 79% of the time. During 1965, a 92.5% reduction in BOD concentration was attained.

The average suspended solids concentration of 363 ppm was greater than the plant design concentration of 270 ppm. From figure 4 it can be seen that the design suspended solids concentration was exceeded 81% of the time during the year.

The average final effluent suspended solids concentration of 40 ppm was greater than the OWRC objective for suspended solids concentration of 15 ppm. This objective was exceeded 90% of the time. A suspended solids reduction of 89.0% was realized during the year.

A total of 940 cubic feet of grit was removed during the year. This represents 1.02 cubic feet per million gallons of sewage treated.



VACUUM FILTER RESULTS

FIG. 7

VACUUM FILTER OPERATION

MONTH	FILTER HOURS		% SOLIDS DIGEST SLUDGE	LBS. DRY SOLIDS FILTERED	LBS. LIME	% LIME	LBS. $FeCl_3$	% $FeCl_3$	% SOLIDS FILTERED SLUDGE	YIELD PSF/HOUR
	#1	#2								
JAN.	253.0	-	5.1	322169	41500	12.9	11841.4	3.68	-	4.2
FEB.	193.0	-	5.8	267773	31900	11.9	5442.0	2.03	17.3	4.6
MAR.	290.5	-	5.7	376153	48875	13.0	12944.2	3.44	17.2	4.3
APR.	262.5	-	5.5	365655	41750	11.4	13382.4	3.66	17.5	4.7
MAY.	220.0	-	5.1	290824	36165	12.4	7612.4	2.62	16.2	4.3
JUNE	241.5	-	5.0	404900	40350	10.0	11240.2	2.78	16.6	3.4
JULY	235.5	-	5.0	285112	39750	13.9	8608.4	3.02	16.6	4.0
AUG.	146.5	-	4.7	186523	29850	14.4	7397.4	3.97	16.4	4.1
SEPT.	60.5	-	5.2	73752	9500	12.9	2508.6	3.45	18.1	4.1
OCT.	11.0	-	7.2	20593	1600	7.8	414.4	2.01	19.6	6.0
NOV.	51.0	-	6.1	70058	7650	10.9	2306.8	3.29	20.4	4.4
DEC.	126.0	-	4.9	155079	22000	14.2	5431.6	3.50	19.5	4.0
TOTAL	2091.0	-	-	2818591	347990	-	89129.8	-	-	-
AVG.	174.2	-	5.4	234883	28999	12.3	7427.5	3.16	17.8	4.3

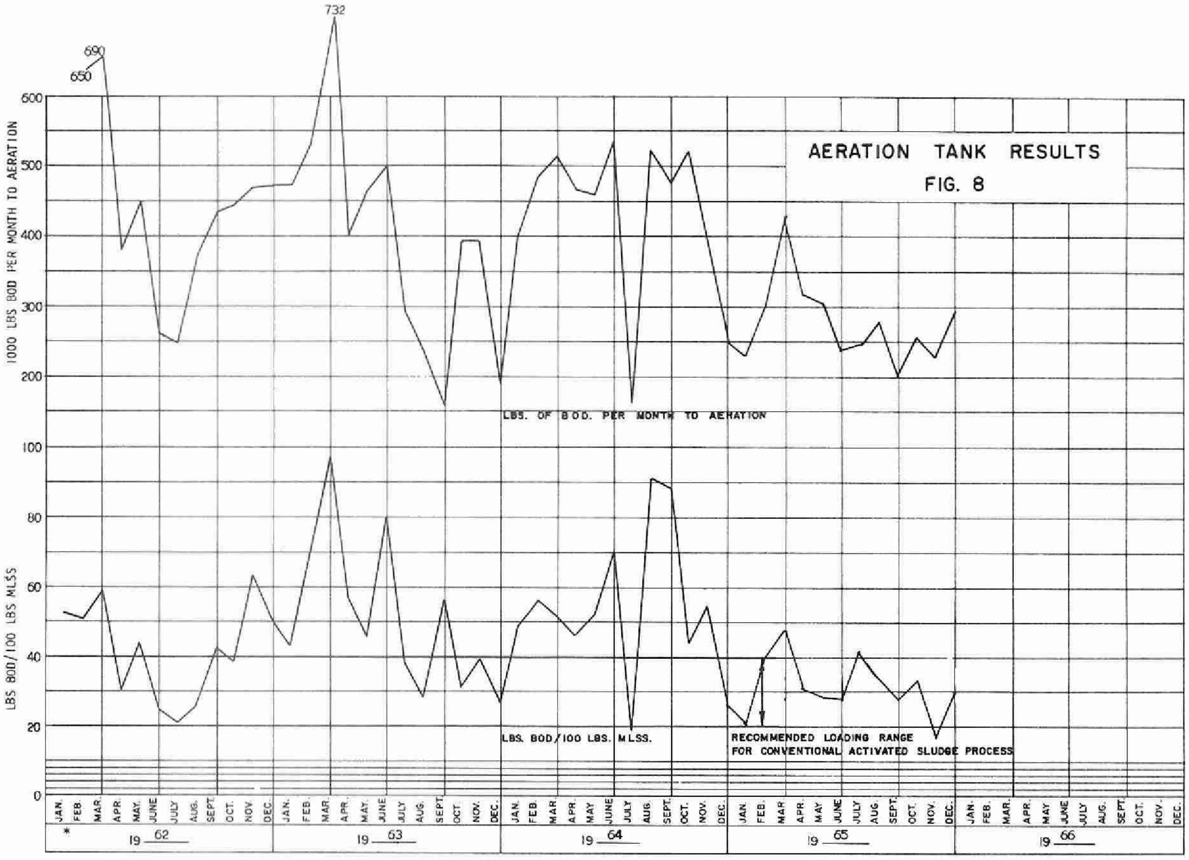
COMMENTS

During 1965, the filter was operated on an average of 174 hours per month and a total of 1,409 tons of dry solids were filtered. This represents a decrease from 1964 due to the reduction in organic loads received at the plant. With an average solids content of 17.8%, the weight of dry solids filtered represents 7,900 tons of sludge which were hauled away by truck.

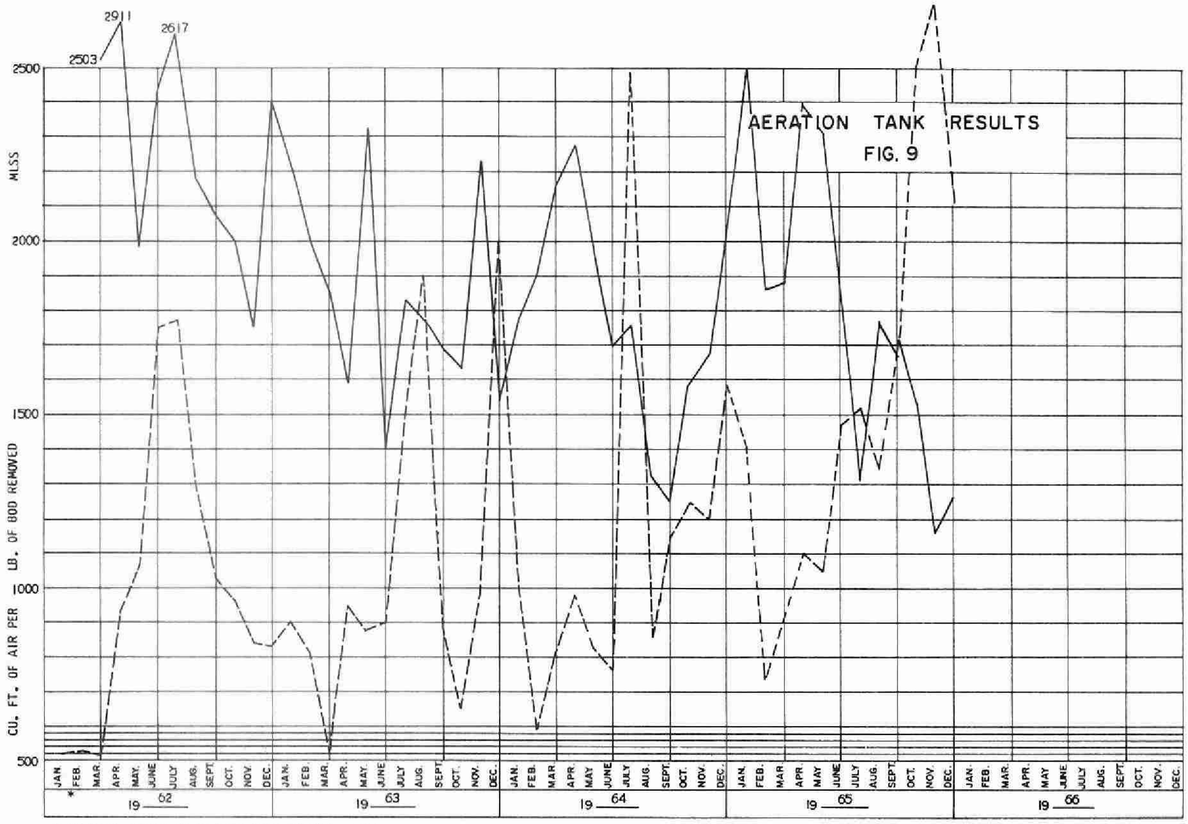
As shown in the table, the vacuum filter reduced the moisture content of the sludge from 94.6% to 82.2% which represents a 69.6% reduction in total volume.

The average filter yield of 4.3 psf/hour is comparable to other plants filtering raw and waste activated sludge and although the yield is slightly less than the average yield for 1964, it represents an efficient filter operation.

The pounds of dry solids filtered per month, the dosage of lime and ferric chloride and the average monthly filter yield in pounds per square foot per hour are plotted in figure No. 7.



AERATION TANK RESULTS
FIG. 8



AERATION TANK RESULTS
FIG. 9

* NO DATA AVAILABLE IN THIS FORM PRIOR TO 1962

AERATION SECTION

MONTH	PRIM. EFFL B.O.D. P.P.M.	M.L.S.S. P.P.M.	LBS. B.O.D. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. B.O.D. REMOVED
JANUARY	332	2525	21	1409
FEBRUARY	478	1873	40	737
MARCH	581	1897	47	933
APRIL	374	2417	31	1102
MAY	366	2334	29	1053
JUNE	330	1886	28	1475
JULY	335	1320	42	1552
AUGUST	412	1773	34	1348
SEPTEMBER	288	1667	28	1729
OCTOBER	340	2526	23	1528
NOVEMBER	282	2849	17	1157
DECEMBER	300	2122	28	1358
TOTAL	-	-	-	-
AVERAGE	368	2099	31	1282

COMMENTS

The primary effluent BOD concentration of 368 ppm for 1965 represents a decrease of 37.8% over 1964. The average loading on the aeration section of 31 lbs. of BOD per 100 lbs. of MLSS is within the acceptable range for a conventional activated sludge process.

There was an increase of 19% in the cubic feet of air supplied per lb. of BOD removed in 1965. To obtain maximum treatment efficiency, the biosorption process was used for most of the year.

The pounds of BOD per month to the aeration section and the average monthly pounds of BOD per 100 lbs. of MLSS are plotted in figure No. 8. In addition, the average monthly MLSS concentration and the average monthly cubic feet of air per pound of BOD removed are plotted in figure No. 9.

SLUDGE

MONTH	SLUDGE TO DIGESTERS	FILTER CAKE	LIQUID
	(in thousands of cubic feet)		
January	102.63	23.27	87.64
February	75.67	15.77	24.95
March	106.16	28.48	25.27
April	107.78	27.58	12.47
May	71.71	18.47	56.05
June	98.62	14.59	58.00
July	94.23	20.25	45.20
August	56.00	13.66	63.99
September	23.50	7.78	57.19
October	45.52	0.97	40.99
November	18.89	3.92	42.96
December	50.96	12.69	29.32
Total	851.67	187.43	544.03
Average	70.97	15.62	45.34

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (P.P.M.)
JANUARY	70.720	4547	6.43
FEBRUARY	64.612	4695	7.27
MARCH	73.636	6133	8.33
APRIL	86.823	4305	4.96
MAY	84.973	5165	6.08
JUNE	73.566	5490	7.46
JULY	70.632	5030	7.12
AUGUST	68.639	4965	7.23
SEPTEMBER	71.451	5415	7.58
OCTOBER	77.467	7855	10.14
NOVEMBER	83.199	5900	7.09
DECEMBER	98.376	5787	5.88
TOTAL	924.094	65287	-
AVERAGE	77.008	5441	7.06

COMMENTS

The average chlorine dosage rate of 7.06 ppm was sufficient to maintain a chlorine residual of 0.5 ppm after a 15 minute contact period. This represents a 24% decrease in dosage rate from the previous year and can be attributed to the lower organic loads received at the plant during the year.

LABORATORY LIBRARY
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CONCLUSIONS

The plant operated quite efficiently during the year considering the adverse conditions experienced.

In the past, it has been recommended that, due to the extreme overloading condition at the plant, enlargement of the plant be carried out as soon as possible. Plant enlargement is planned for 1966.

MAR 23 1970
MAY 25 1970

ONTARIO WATER RESOURCES COMMISSION